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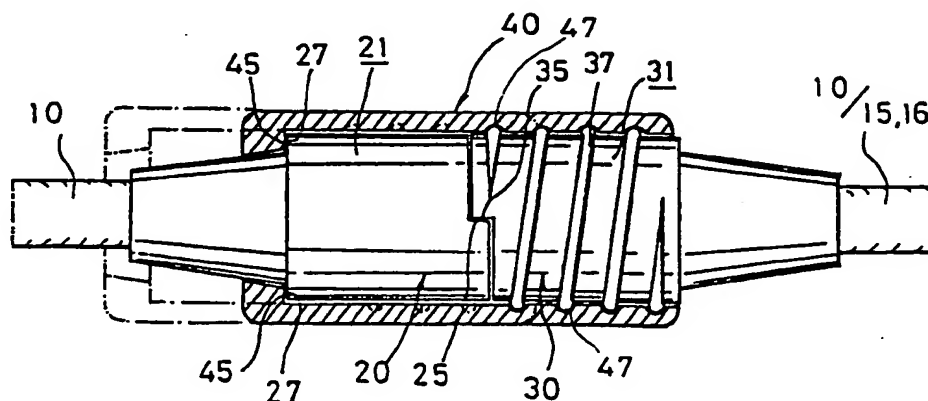
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### 54 Connecting apparatus for connecting lines.

57 A connecting apparatus is disclosed having first and second connecting elements (20, 30) each having an end piece (21, 31) to which a line (10), such as a rope or a cable is connected, and which has a complementary opposed end face (25, 35) so as to come into contact with each other without relative rotation therebetween. The end pieces (21, 31) are connected together in and by a nut member (40). One of the end pieces (31) has an outer peripheral threaded portion (37) which can be screwed within the nut member (40).

Fig. 1



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### APPARATUS FOR CONNECTING LINES

This invention relates to an apparatus for connecting lines, such as cables, cords, wires or ropes, and particularly it relates to a connecting apparatus which can be advantageously used to connect ropes used in a stringing operation of power transmission cables so as to tense or fix the latter.

Furthermore, the present invention can also be adapted to connect ropes or wires for rope construction, such as a suspension bridge, a ropeway or a cable railway; or ropes or wires for supporting masts or posts or the like.

Ropes which are used in a stringing operation of power transmission cables usually have looped ends which can be connected to or engaged by another cable for extension.

The looped end is usually made in a so-called eye-splice process in which the strands of the terminal end of the rope are frayed and twisted, so that the strands are woven into the terminal end portion of the rope itself. The eye-splice provides a relatively large strength, in comparison with other connecting means such as chips. This, however, is a relatively complex operation requiring a highly skilled person.

According to the present invention, there is provided an apparatus for connecting lines, comprising: first and second connecting elements having end pieces which have opposed end faces which are capable of coming into contact with each other, one end piece being provided with an abutment and at least the other end piece being provided with an outwardly directed peripheral threaded portion; and a nut member in which said end pieces can be inserted and which is provided with an inwardly directed threaded portion, so that said threaded portion of the end piece(s) can be screwed within the nut member, said nut member being provided with a counter abutment which can engage said abutment of the one end piece so that, when the end pieces are inserted in the nut member, the end pieces can be integrally connected in and to the nut member by the screw engagement between the threaded portion of the other end piece and the nut member and by the engagement between said abutment and the counter abutment.

The present invention provides a simple apparatus for connecting lines, such as cables, ropes, wires or the like, which is free from the troublesome operations involved in the conventional eye-splice process referred to above.

In a preferred embodiment of the present invention, said end faces of the end pieces have complementary shapes to each other.

In another preferred embodiment, said end pieces have complementary shapes such that, when they were into contact, relative rotation of the said end pieces is prevented.

In another preferred embodiment, said abutment is made of an annular shoulder face provided on one of the end pieces and wherein said counter abutment is made of a restricted end face provided on the nut member.

In another preferred embodiment, each of said end pieces has a rope or similar member connected thereto.

In another preferred embodiment, said ropes are made of strands and are connected to the respective end pieces by the strands being frayed and spread in the end pieces together with an adhesive.

In another preferred embodiment, at least one of said end pieces has, at its end remote from the opposed end face, an eye piece.

In another preferred embodiment, at least one of said end pieces has, at its end remote from the opposed end face, a connecting jaw.

In another preferred embodiment, each of said end pieces comprises a substantially cylindrical hollow body.

For a better understanding of the present invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional view of one embodiment of a connecting apparatus according to the present invention;

Fig. 2 is an exploded perspective view of the connector elements shown in Fig. 1;

Fig. 3 is a longitudinal sectional view of the connector elements shown in Fig. 1;

Fig. 4 is a longitudinal sectional view of a connecting apparatus according to another embodiment of the present invention;

Fig. 5 is an exploded perspective view of the connector elements shown in Fig. 4;

Fig. 6 is a side elevational view of a connector element with an eye piece; and,

Fig. 7 is a side elevational view of a connector element with a connecting jaw.

As can be seen from Fig. 1 the connecting apparatus of the present invention has a pair of connector elements 20 and 30 which have end pieces 21 and 31 having ropes 10 connected thereto or other anchoring or connecting means 15 or 16 to which ropes etc. are connected, respectively. Each of the end pieces 21 and 31 is preferably made of a cylindrical metal plate or iron or chromium molybdenum steel, or the like.

The cylindrical end piece 21 of the connector element 20 has a stepped end 25 opposed to the end piece 31. The rope 10 (or 15, 16) is connected to the other end of the end piece 21. The end piece 21 is also provided, on its outer periphery, with a shoulder portion 27. The stepped end 25 can be made by cutting a half of the circular end face of the end piece 21 away, so that the stepped end 25 consists of a semicircular projection and a semicircular recess. The peripheral shoulder portion 27 has a continuous annular shoulder face, as can be seen in Fig. 2.

The end piece 31 of the connector element 30 has a stepped end 35 which has a shape complementary to the shape of the stepped end 25, so that the stepped end 35 can be snugly engaged by the stepped end 25 of the end piece 21 when the two end pieces 21 and 31 come into contact with each other.

The end piece 31 is provided, on its outer periphery, with a threaded portion 37 which can be engaged in a nut member 40 which will be described in detail hereinafter. The two end pieces 21 and 31 are aligned and are brought into contact with each other so that the stepped end faces of the stepped ends 25 and 35 face to each other. When the stepped ends 25 and 35 are opposed to each other, the semicircular recessed portion of the stepped end 25 comes into contact with the semicircular projection of the end 35 and the semicircular projection end 25 comes into contact with the semicircular recessed portion of the end 35, respectively, so that the two end pieces 21 and 31 are connected to each other so as not to relatively rotate.

The cylindrical hollow nut member 40 has a restricted end face (a counter abutment) 45 at one end, so that the shoulder portion (abutment) 27 of the end piece 21 comes into contact with the end face 45 when the end piece 21 is fully inserted in the nut member 40, thus preventing the end piece 21 from coming out of the nut member 40. The nut member 40 is provided, on its opposite end, with a female threaded portion 47 on the inner periphery thereof. The threaded portion 37 of the end piece 31 can be screwed into the threaded portion 47 of the nut member 40. Thus, the two connector elements 20 and 30 can be connected together in and by the nut member 40. The nut member 40 is preferably made of iron or chromium molybdenum steel similar to the end pieces 21 and 31. When the end piece 31 is screwed into the nut member 40, the shoulder portion 27 of the end piece 21 is tightly pressed against the inner end face 45 of the nut member 40.

The connection of the rope 10 to the end piece 21 or 31 can be effected as follows.

With reference to Fig. 3, the end portions 11a of the strands 11, of which the rope 10 is made, are frayed and spread with a resin adhesive 19, such as epoxy resin, in the associated hollow end piece 21 or 31, so that the frayed ends of the strands 11 can be firmly connected to and in the end piece by the adhesive 19. The numeral 12 designates a protecting insulation layer of the rope 10, such as polyurethane.

Figs. 4 and 5 show a variant of the end pieces 21A and 31A. In the arrangement illustrated in Figs. 4 and 5, the end piece 21A has spaced circumferential, paraxial projections 25A on its one end, and the end piece 31A has, on its one end, spaced circumferential, paraxial projections 35A which are complementary to the spaced projections 25A of the end piece 21A. Elements other than the complementary end shapes of the end piece 21A and 31A are the same as those shown in Fig. 1.

In a different embodiment, shown in Figs. 6 and 7, the end pieces 31B and 21B have an eye piece 15 and a connecting jaw 16 instead of the ropes 10, respectively. The eye piece 15 and the jaw 16 can be connected to the respective end pieces 31B and 21B, for example, by means of welding. Alternatively, it is also possible to make the eye piece and the jaw integral with the respective end pieces as a single piece, respectively.

As can be understood from the above discussion, according to the present invention, ropes, wires, cables or the like can be easily connected by means of the respective end pieces connected thereto and the nut member which can be engaged by the end pieces. Furthermore, according to a preferred arrangement of the present invention, since the end faces of the opposed end pieces have complementary shapes, no rotation between the end pieces takes place, when they are connected to each other, by virtue of the nut member which is rotated when being fastened. The end pieces can be easily connected not only to ropes, wires, cables or other line materials, but also to connecting means, such as eye pieces, hook or connecting jaws, to which the ropes or the like are connected. According to the present invention, since no eye-splice process is necessary, unlike the prior art, no highly skilled operator is needed in a stringing operation. In addition to the foregoing, the connecting apparatus of the present invention can be mass-produced.

## Claims

1. An apparatus for connecting lines, comprising: first and second connecting elements having end pieces which have opposed end faces which are capable of coming into contact with each other,

one end piece being provided with an abutment and at least the other end piece being provided with an outwardly directed peripheral threaded portion; and a nut member in which said end pieces can be inserted and which is provided with an inwardly directed threaded portion, so that said threaded portion of the end piece(s) can be screwed within the nut member, said nut member being provided with a counter abutment which can engage said abutment of the one end piece so that, when the end pieces are inserted in the nut member, the end pieces can be integrally connected in and to the nut member by the screw engagement between the threaded portion of the other end piece and the nut member and by the engagement between said abutment and the counter abutment.

2. An apparatus according to the claim 1, wherein said opposed end faces of the end pieces have complementary shapes to each other.

3. An apparatus according to the claim 2, wherein said end pieces have complementary shapes such that, when they were into contact, relative rotation of the said end pieces is prevented.

4. An apparatus according to the claim 1, 2 or 3, wherein said abutment is made of an annular shoulder face provided on one of the end pieces and wherein said counter abutment is made of a restricted end face provided on the nut member.

5. An apparatus according to any preceding claim, wherein each of said end pieces has a rope or similar member connected thereto.

6. An apparatus according to the claim 5, wherein said ropes are made of strands and are connected to the respective end pieces by the strands being frayed and spread in the end pieces together with an adhesive.

7. An apparatus according to any one of claims 1 to 4, wherein at least one of said end pieces has, at its end remote from the opposed end face, an eye piece.

8. An apparatus according to any of claims 1 to 4, wherein at least one of said end pieces has, at its end remote from the opposed end face, a connecting jaw.

9. An apparatus according to any preceding claim, wherein each of the said end pieces comprises a substantially cylindrical hollow body.

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Fig. 1

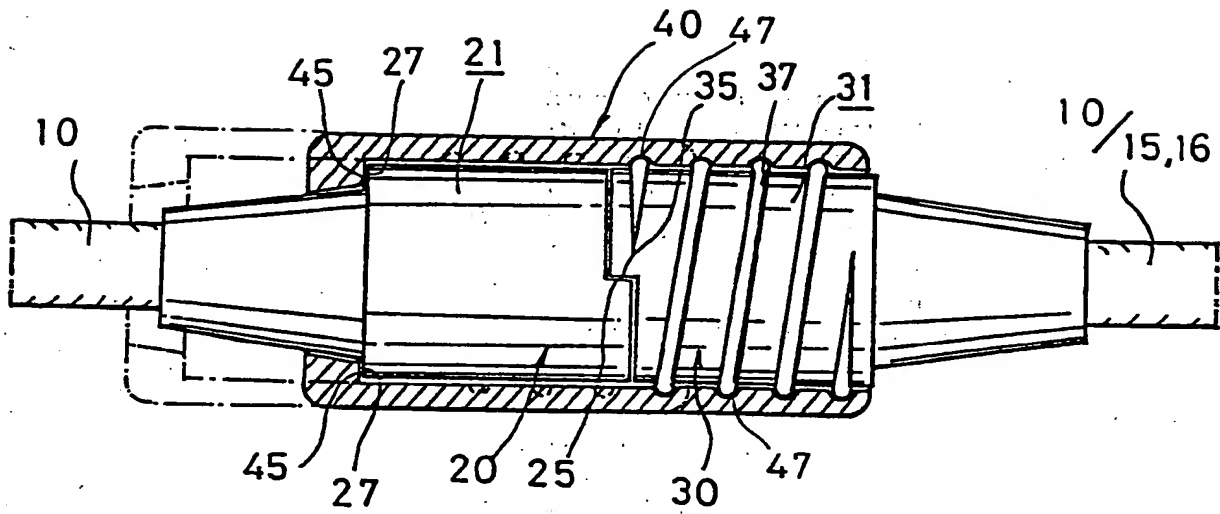


Fig. 2

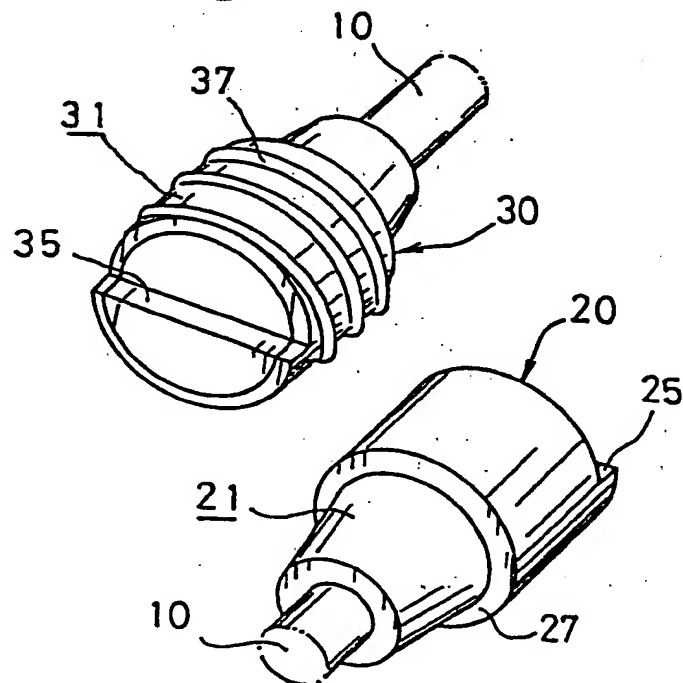


Fig.3

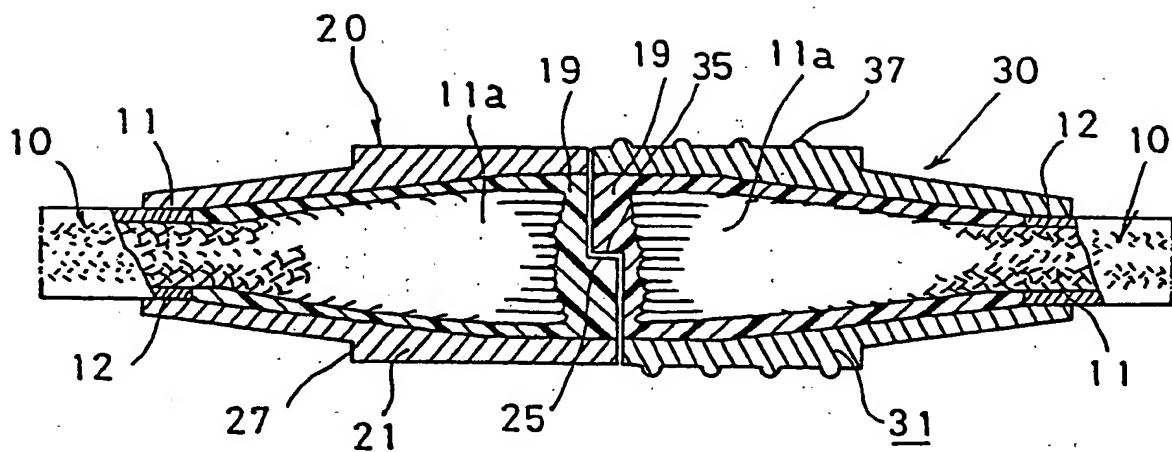


Fig.6

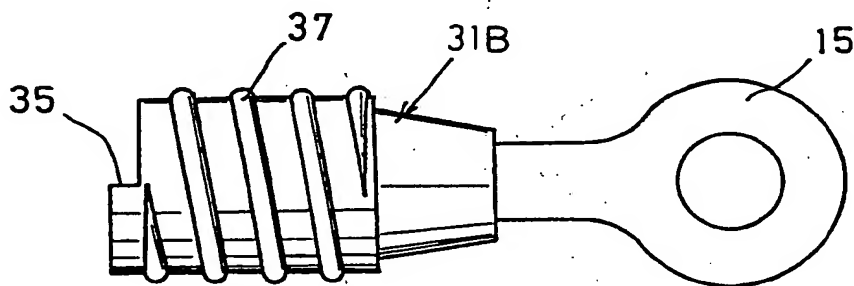


Fig.7

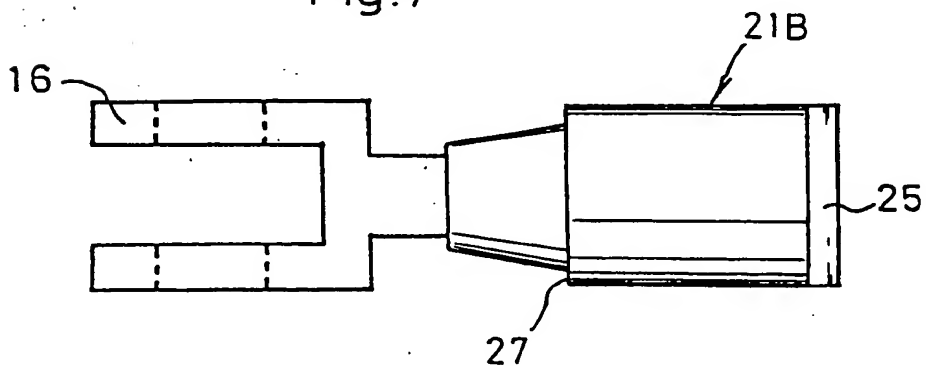


Fig. 4

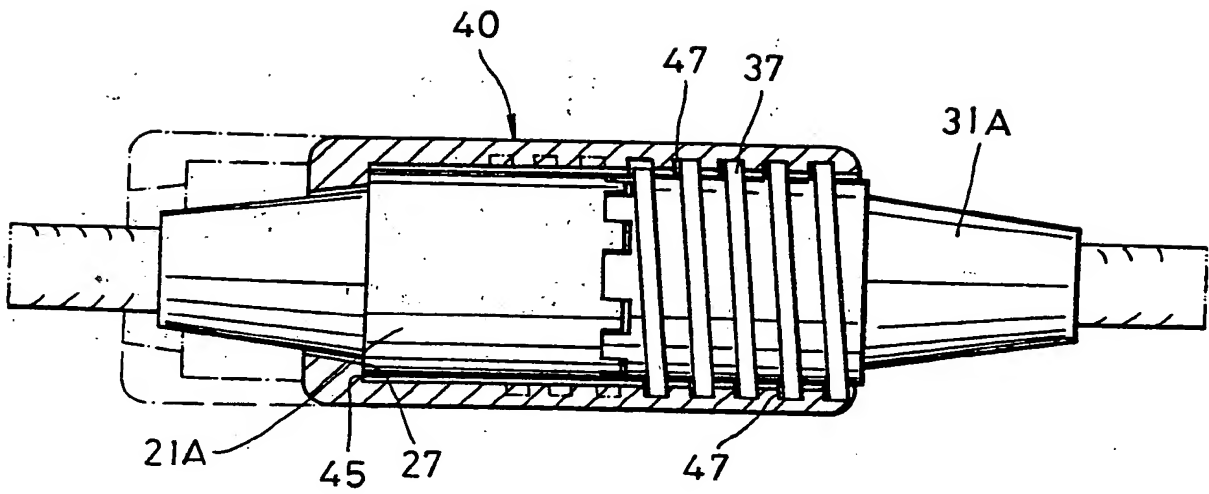
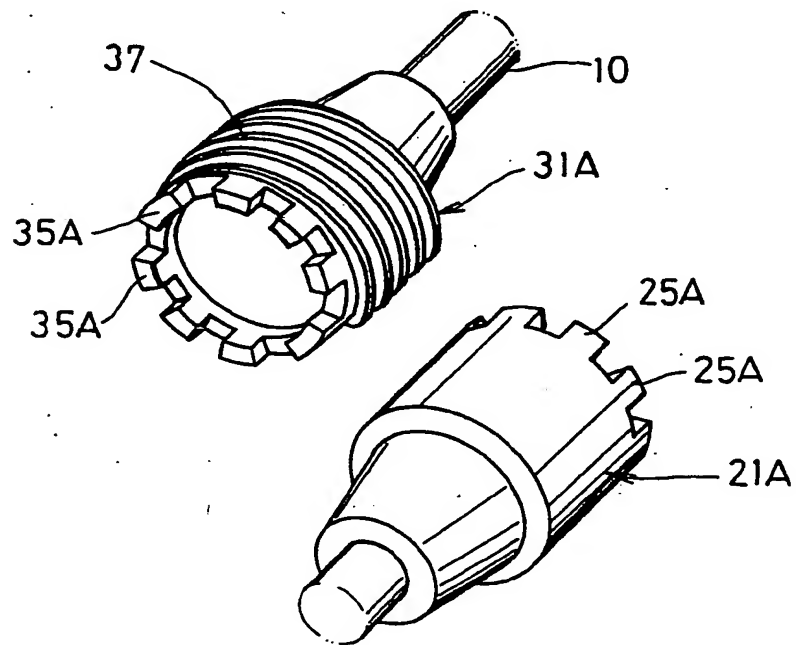


Fig. 5



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